Title: Excavating and Loading Machine

Description of Invention

This invention relates to a wheeled excavating and loading machine.

Excavating and loading machines are known which have a body with a loading arm at a front end of the body and an excavating arm at a rear of the body, and a wheeled ground engaging structure, such as a pair of axles carrying ground engaging wheels.

Such machines are either steerable by the wheels on one or both of the axles being steerable, or by the body being articulated.

In each case, a combined excavating and loading machine provides for an owner, a versatile machine which is capable of performing a variety of excavating and loading operations. However, in providing a machine which is capable of performing both excavating and loading operations, design compromises have been made with the result that when the machine is performing particularly excavating operations, machines have tended not to be as capable as a dedicated excavating machine for example of the kind in which an excavating arm is carried on a superstructure which is rotatable about a generally upright axis, on a ground engaging structure.

This is particularly the case where configurations of the body and wheeled ground engaging structure of the combined excavating and loading machine can prevent a trench readily being excavated closely adjacent an obstacle such as a wall. On some combined machines the, usually centrally mounted, excavating arm can be moved sideways on a carriage so that the arm may be used to excavate a trench closer to the obstacle, but moving the arm in this manner can present visibility difficulties for an operator.

According to a first aspect of the invention we provide an excavating and loading machine having a body with a front end and a rear end, the body being carried on a steerable wheeled ground engaging structure, the machine

including a loading arm assembly which is mounted on the body and extends forwardly of the body, and an excavating arm, and wherein the excavating arm is mounted on a superstructure which includes an operator's cab, the superstructure being rotatable about a generally upright axis relative to the body during the performance of excavating operations, and the excavating arm is mounted on the superstructure by a mounting which permits the arm to slew relative to the superstructure, about a generally upright slew axis as well as to permit the excavating arm to be raised and lowered about a generally horizontal axis.

The excavating arm may be of the kind including at least two sections which are relatively moveable about a generally horizontal axis, with there being an excavating tool, such as an excavating bucket, mounted at an outer end of the excavating arm, although other tools including non-excavating tools may be mounted on the excavating arm for performing specialised work operations.

Thus a machine in accordance with the invention extends the capabilities of known excavating and loading machines, in that the excavating arm is movable together with the cab to enable excavating operations to be carried out in a wide variety of positions, without having to move the excavating arm along a carriage to a position where the operator may be unsighted. Thus the advantages of dedicated excavating machines of the kind mentioned above, are realised in a combined excavating and loading machine.

Preferably, the superstructure is lockable in a desired rotational position relative to the body, during use of the excavating arm.

In a preferred arrangement, the superstructure is mounted at or towards a rear of the body, e.g. over a rear axle of the wheeled ground engaging structure, in which case the rotatable superstructure may carry mudguards for the rear wheels. Although these will rotate with the superstructure, when the machine is driven over the ground, the superstructure will be orientated in a straight ahead

position, with the excavating arm mounting generally centrally of the body between the sides.

Thus the cab may include within, first controls for driving the machine over the ground and for operating the loading arm assembly, which the operator will use when the cab is in the straight ahead position, and second controls for operating the excavating arm and for rotating the superstructure. The cab may include a rotatable operator's seat to enable the driver to access and use the first or second controls as appropriate.

The loading arm assembly may be of the single arm kind, the single arm being mounted in a generally central position between sides of the body, forwardly of the superstructure.

In a preferred arrangement, the loading arm assembly includes a pair of loader arms each extending along a side of the body.

In any event it will be realised that the rotatable superstructure will be incapable of a full 360° rotation without the excavating arm fouling the body and/or the loading arm assembly, but preferably stops are provided mechanically to limit the rotation of the superstructure although the superstructure may rotate through up to 300°.

The body of the machine may house an engine to power the machine, the engine being provided preferably forwardly of the rotatable superstructure, generally centrally between the sides of the body. Where the loading arm assembly has a single arm, the engine may be positioned beneath an inner end of the loading arm, or where the loading arm assembly includes a pair of arms, the engine may be provided between the arms, at least when in a lowered condition. Alternatively the engine may be mounted to one side of the machine.

The loading arm assembly may be pivotal relative to the body about a generally horizontal mounting axis, and may include a plurality of telescopic

sections whether a single arm or double arm, a loading tool, such as a bucket may be mounted at an outermost end of the loading arm assembly.

The superstructure may be rotatable relative to the body by a hydraulic or electric motor as desired.

Embodiments of the invention will now be described with reference to the accompanying drawings in which:-

FIGURE 1 is an illustrative perspective view of an embodiment of the invention with a superstructure in one rotational position;

FIGURE 2 is an illustrative rear view of the machine of figure 1 with the superstructure in an alternative rotational position, but with stabiliser arms omitted for clarity.

FIGURE 3 is a view similar to figure 1, but showing an alternative embodiment of the invention.

Referring to figures 1 and 2 of the drawings there is shown an excavating and loading machine 10 which includes a body 11 carried on a wheeled ground engaging structure 12 which includes a front axle 13 and a rear axle 14, wheels 15 carried by the front axle 13 being steerable by hydraulic and/or mechanical means.

Rear wheels 16 carried by the rear axle 14 are not steerable in this example, but in another embodiment, may be, and/or the body 11 may be articulated.

Mounted on the body 11 at a mounting 18 is a loading arm assembly 20 which includes a single arm which extends forwardly of the mounting 18 beyond a front end of the machine 10. The mounting 18 permits the loading arm assembly 20 to be raised and lowered about a generally horizontal axis A, by hydraulic or other actuators 21.

The mounting 18 for the loading arm assembly 20 is generally central of the body 11 between sides of the body 11, and the loading arm assembly 20 extends downwardly over a bonnet 22 beneath which an engine (not shown) is

housed. Thus in this example the engine is generally centrally mounted towards the front of the body 11.

The loading arm assembly 20 in this example includes two telescopic sections 20a, and 20b, with there being a loading bucket 23 or other loading tool at the outermost end of the loading arm assembly 20, but the loading arm assembly 20 may have more than two such telescopic sections if desired.

Mounted on the body 11 is a superstructure 25 which includes an operator's cab 26. The operator's cab 26 includes within it, a rotatable operator's seat 27 which may be rotated to enable an operator to access and operate first controls, for driving the machine 10 over the ground and for operating the loading arm assembly 20, or to enable the operator to access second controls within the cab 26.

The superstructure 25 is mounted towards a rear end of the body 11 for rotation about a generally upright axis B which is located generally centrally of the body 11 between the sides by a hydraulic or electrically powered motor, controlled by the second controls within the cab 26. Moreover the superstructure 25 has mounted upon it, an excavating arm 30 the operation of which is also controlled by the second controls within the cab 26.

The excavating arm 30 is mounted by a mounting 32 generally centrally of the sides of the cab 26, for movement about a further generally upright axis C, e.g. on a king post or the like, and for movement about a generally horizontal axis D, such movements being effected by respective hydraulic actuators or the like controlled by the second controls within the cab 26. A king post type of mounting typically would permit the excavating arm 30 to slew through up to 180°.

The excavating arm 30 has two sections 30a, 30b in this example which are relatively pivotal about a horizontal axis indicated at E, again by actuators controlled by the second controls in the cab 26, and at the extreme outward end of the arm 30 there is mounted an excavating tool 35, i.e. a bucket in this

example, although the bucket 35 may be replaced by another tool, such as a hammering tool for specialised work operations. Again the bucket 35 is controlled by the second controls in the cab 26.

Because of the position of the mounting 18 for the loading arm 20 and other body 11 features, the superstructure 25 cannot be rotated or slewed on the body 11 though a full 360°, but preferably can be rotated or slewed through up to 300°, when mechanical stops provided on a slewing ring will engage to prevent the superstructure 25 being rotated such that damage might be caused to the body 11. Instead of or in addition to mechanical stops, hydraulic interlocks might be provided to restrict rotation of the superstructure 25 beyond its design limit, e.g. a hydraulic brake may be provided for a hydraulic motor used to slew the superstructure 25.

When it is desired to use the machine 10 to perform loading operations, the superstructure 25 is rotated so that the excavating arm 30 mounting 32 is located at the rear of the machine 10 generally centrally between the sides of the body 11. The superstructure 25 is locked in this position, preferably mechanically and the operator's seat 27 would be orientated so as to face forward. Thus the operator would operate the first controls, and loading operations may be performed. Mudguards 42 carried on the superstructure 25 would, with the superstructure 25 in this position, be above the rear wheels 16 so that these may perform their function of reducing spraying of mud as the machine 10 is moved over the ground.

When it is desired to perform excavating operations, and mechanical superstructure locks are released, and the operator's seat 27 is rotated in the cab 26 to enable the operator to access and use the second controls. Thus the operator may rotate the superstructure 25 and operate the excavating arm 30 whilst performing an excavating operation.

As indicated in figure 1, an excavating operation, e.g. to dig a trench alongside an obstacle may be carried out by combining rotating the

superstructure 25 and slewing the excavating arm 30 about the upright slewing axis C.

Desirably, the superstructure 25 is rotated to a desired rotational position relative to the body 11, and is then set, e.g. by mechanical/hydraulic locking device, relative to the body 11, and thus during excavating operations, the excavating arm 30 is moveable relative to the superstructure 25 about axes C and D, but with the superstructure 25 locked in a preferential rotational position.

Further features of the machine 10 will be apparent to those skilled in the art from the drawings. For example, a pair of stabiliser legs 50, 51 may be provided at the rear of the body 11 (only shown in figure 1), to stabilise the machine 10 during excavating operations, the legs 50, 51 being lowerable into engagement with the ground, and raisable out of contact with the ground mechanically or by suitable power means such as hydraulic actuators.

It can be seen that the superstructure 25 is positioned above the rear wheels 16 of the machine 10 in this example, for further stability and the mounting 32 for the excavating arm 30 on the superstructure may, when the superstructure is adequately rotated, be above the rear wheels 16.

In figure 3, a machine 10 similar to that shown in figures 1 and 2 is shown, but in this example, the loading arm assembly 20, instead of having a single arm, has a pair of arms 20c. When the assembly 10 is lowered, the arms 20c extend either side of the body 11 with the bonnet 22 and the engine beneath the bonnet, between them. Otherwise similar parts to the machine 10 of figure 1 are indicated by the same references.

If desired, for a machine 10 of the kind shown in figures 1 or 3, instead of the machine engine being provided generally centrally of the body 10 beneath the bonnet 22, a side mounted engine may be provided.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in

terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.